**COURSE SYLLABUS**

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| **Subject: Surfaces and interfaces of Materials** | **Academic field: Materials Science and Nanotechnology** |
| **Lecturer: Thi Thu VU** |  |
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| **Academic year: 2015 - 2016** |  |

**COURSE DESCRIPTION**

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| --- | --- | --- |
| **Credit points** | 3 | |
| **Level** | Bachelor 2 | |
| **Teaching time**  **Location** | ?????  University of Science and Technology of Hanoi | |
| **Time Commitment** | Lecture | 30 hrs |
| Tutorial | 0 hrs |
| Practice | 0 hrs |
| Lab-work | 0 hrs |
| Total | 30 hrs |
| **Prerequisites** | Chemistry, solid-state-physics, Materials Characterization Techniques | |
| **Recommended background knowledge** | Chemistry, solid-state-physics, Materials Characterization Techniques | |
| **Subject description:** | The aim of this course is to present fundamental, elaboration and characterization techniques of surfaces and interfaces of materials | |
| **Objectives & Out-come** | Upon completion of this course, a student should be able to:   * Understand fundamental phenomena at surfaces and interfaces of materials * Know basic techniques to elaborate solid/solid, solid/liquid, liquid/liquid interfaces * Know basic techniques to characterize solid/solid, solid/liquid, liquid/liquid interfaces | |
| **Assessment/ Evaluation** | Attendance/Attitude | 20 % |
| Class exercise(s) | 0 % |
| Assignment(s) | 0 % |
| Report(s) | 0 % |
| Mid-term test | 30 % |
| Final exam | 50 % |
| **Prescribed Textbook(s)** | Handbook of Surfaces and Interfaces of Materials – H.S. Nalwa, Academic Press, 2001 | |

**COURSE CONTENTS & SCHEDULE**

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| --- | --- | --- | --- | --- | --- | --- |
| **Class** | **Contents** | **Hours** | | | **Ref./Resources** | **Assignment(s)** |
| **Lect.** | **Exr.** | **Prc.** |
| 1 | **1. Surface and interface phenomena**  1.1. Fundamental concepts  1.2. Microstructure and properties of interfaces between dissimilar materials  1.3. Thermal oxidation of silicon and Si-SiO2 interface morphology, structure and localized state  1.3. Surfactant adsorption layers at liquid-fluid interfaces  1.4. Isothermal diffusion and intra-diffusion in surfactant solutions  1.5. Catalysis by supported metal oxides | 6 | 0 | 0 |  |  |
| 2 | **2. Surface and interface analysis and properties**  2.1. Composition structure and topography  2.2. Dynamic surface tension and surfactant mass transfer kinetics  2.3. Application of photoelectron spectroscopy in inorganic and organic material systems  2.4. Spectroscopic characterization of oxide/oxide interfaces  2.5. Photonic and electronic spectroscopies for the characterization of organic surfaces and organic molecules adsorbed on surfaces  2.6. Visualization of polymers at surfaces and interfaces with atomic force microscopy | 6 |  | 0 |  |  |
| 3 | **3. Nanostructured materials, micelles, and colloids**  3.1. Nanostructured metal clusters and colloids  3.2. Nanoparticle thin films : an approach based on self-assembly  3.3. Assembly of colloidal particles into nanostructured materials and microscopic devices  3.4. Thin film nanofabrication by alternate adsorption of polyions, nanoparticles, and proteins  3.5. Core-shell nanoparticles and assemblies thereof  3.6. Crystalline nanoparticles in glasses for optical applications | 6 | 0 | 5 |  |  |
| 4 | **4. Solid thin film and layers**  4.1. Langmuir-Blodgett and self-assembled polymeric films  4.2. Morphological and structural aspects of thin films prepared by vapour deposition  4.3. Elaboration of polymer brushes towards life science | 6 | 0 |  |  |  |
| 5 | **5. Biomolecules, biointerfaces and applications**  5.1. Interfacial and materials aspects of the immobilization of biomolecules onto solid surfaces  5.2. Thin films on electrodes for direct protein electron transfer  5.4. Molecular organization of peptides and their function  5.6. Conducting polymer-based Schottky barrier and heterojunction diodes and their sensor application | 6 | 0 | 0 |  |  |

*Notes:*

* *Abbreviation: Lect. (lecture), Exr. (Exercise), Prc. (Practise).*
* *Assignments may include assignments, practical work, reports, exercises ...for each class sessions*